NEW DEAIRING TECHNIQUE: QUESTIONS AND CAVEATS

To the Editor:

Al-Rashidi and colleagues[1] provide important information with regard to a new technique for de airing in cardiac surgery; however a number of questions need to be answered before adoption of their proposed new technique.

First, their technique of deairing the heart by apical venting and active suctioning on the root may potentially entrain air into the aortic root,[2] because the active suctioning causes a negative pressure in the aorta—causing it to collapse, as they mention in their Methods section. Opening the root to the atmosphere is safer, because the positive pressure in the aortic root forces air outward instead of sucking it inward.

Second, concerns of the effect of carbon dioxide insufflation on arterial blood gases can be negated by its use at the end of the procedure before deairing, because it is not needed until the crossclamp has been removed. This allows normal oxygenator gas flow rates. Altering the arterial carbon dioxide levels may be detrimental, which is the whole basis of the pH stat and alpha techniques for acid–base balance.

Third, allowing both lungs to collapse causes pulmonary vasoconstriction, meaning that the lungs will only derive oxygen from the bronchial arteries. Because bronchial arteries are highly variable in their number, size, and flow and are frequently blocked by atherosclerosis in elderly patients,[3] pulmonary ischemia may become an important issue, causing postoperative pulmonary dysfunction and adding to the problem of postoperative atelectasis. A study involving only 20 patients is statistically underpowered to evaluate this potential deleterious side effect or to make any conclusions other than that the technique is possible.

Fourth, transesophageal echocardiographically guided deairing through the left ventricular apex is frequently ineffective for residual bubbles in the left ventricle, and passive root venting is more efficient. In addition, air emboli in the left atrium and ventricle are easier to detect with transesophageal echocardiography, but in practice the aortic root is clinically the most important anatomic compartment with regard to deairing.

Finally, 10 minutes of suction on the aortic root to deair will undoubtedly cause blood component damage and extend cardiopulmonary bypass. These effects need to be balanced against a transesophageal echocardiographic or transcranial Doppler statistical finding with no clinical correlation.

Al-Rashidi and colleagues need to address these points in a study with a clinically significant number of patients undergoing more homogeneous operative interventions before their findings can be adopted.

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References

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Reply to the Editor:

I thank Poullis for his valuable comments and questions with regard to our article in this journal.[1] I will address his questions one by one in the same order that they were posed.

I agree with Poullis that active suction of the aortic root may entrain air in the aortic root if a left ventricular vent is used simultaneously. We therefore recommended in the text that the left ventricular vent should be occluded while the aortic root is on active suction. Opening the aortic root to atmosphere is safe, but it is not as effective as active suction, especially if the aortic root has been replaced with a vascular prosthesis (unpublished data). It is likely that air emboli get entrained in the crimp of the vascular prosthesis and get detached first when the aortic root gets fully distended with an adequate systemic arterial blood pressure. In an earlier study and in the evolution of our deairing technique, we let the aortic root deair spontaneously by open exposure to the ambient atmosphere and found that the number of microembolic signals recorded by transcranial Doppler was significantly higher after removal of the aortic crossclamp and before the cardiac ejection had started, suggesting entrained air emboli in the aortic root and ascending aorta.[2] These microembolic signals were significantly reduced with active suction of the aortic root.[1]

I believe that it is worthwhile finding out in a prospective randomized study whether the use of carbon dioxide at the end of the open surgery on the left side of the heart is as effective as when the gas is used from the beginning of the surgery. I am concerned, however, about the air that escapes into the left atrium and